

SEPTEMBER 2001 SAMPLING REPORT
FOR THE SCARBORO COMMUNITY
OAK RIDGE, TENNESSEE

FINAL REPORT

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Science and Ecosystem Support Division
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LIST OF ACRONYMS

ARARs.....	applicable or relevant and appropriate requirements
ATDSR.....	Agency for Toxic Substances and Disease Registry
CAS #.....	Chemical Abstract Service Number
COPC.....	contaminant of potential concern
DOE.....	United States Department of Energy
EPA.....	United States Environmental Protection Agency
EIB.....	Enforcement Investigations Branch
FFB.....	Federal Facilities Branch
g.....	gram
GPS.....	Global Positioning System
kg.....	kilogram
L.....	Liter
LOC.....	Local Oversight Committee
MCLs.....	maximum concentration limits
mg/kg.....	milligrams per kilogram
ml.....	milliliter
NAREL.....	National Atmospheric Radiation and Environmental Laboratory
NPDWR.....	National Primary Drinking Water Regulation

NSDWS.....	National Secondary Drinking Water Standards
ORR.....	Oak Ridge Reservation
ORSSAB.....	Oak Ridge Site Specific Advisory Board
PCBs.....	Polychlorinated Biphenyls
pCi/g.....	picoCuries per gram
pCi/L.....	picoCuries per Liter
PRGs.....	preliminary remediation goals
SCS.....	Scarboro community sample
SVOCs.....	semi-volatile organic compounds
SESD.....	Science and Ecosystem Support Division
TDEC.....	Tennessee Department of Environment and Conservation
TDH.....	Tennessee Department of Health
ug/kg.....	micrograms per kilogram
ug/L.....	micrograms per Liter
VOCs.....	volatile organic compounds

EXECUTIVE SUMMARY

The Environmental Protection Agency has completed its study of soil and water quality in the Scarboro community of Oak Ridge Tennessee. EPA's study results are in agreement with similar, more extensive, studies done in 1998 by Florida Agricultural and Mechanical University (FAMU). EPA's study analyzed for hazardous substances and radionuclides associated with the operations of the nearby Y-12 Plant, several of which had not been included in sample analysis from other studies. EPA's work gives a completed representation of any contamination that might have been encountered. These results confirm that existing soil and water quality pose no risk to human health within the Scarboro community.

The Scarboro Community is located about 1,500 feet northwest and along the boundary of the Department of Energy(DOE), Oak Ridge Reservation (ORR). It is the nearest residential community to active DOE operations or property. This small, urban, minority community occupies about 250 acres and is located in east Oak Ridge. The community is bounded to the west by East Fork Ridge and to the east by Pine Ridge (Figure 1). The topography consists of gently rolling hills that have been cleared for residential use.

On September 25, 2001, EPA representatives collected soil, sediment and surface water samples from selected locations in the Scarboro Community. EPA collected a total of 10 samples from 9 separate locations that involved 8 properties. Twenty (20%) percent of the DOE sampling locations were selected by EPA for sampling. The sample sites were based on: 1) the May 1998 DOE study, 2) reconnaissance performed in February 1999 by EPA field personnel, 3) information gathered during the February 1999 and September 2001 public meetings held in Oak Ridge, and 4) judgement regarding where an unreasonable risk to human health might be found if such were to exist. Six (6) of the 10 samples were collected because of the elevated mercury and/or radiation results obtained in the May 1998 DOE effort. All of the EPA samples were subjected to full analytical scan.

Neither air monitoring or ecological impact assessment was conducted as part of this study. This study was not designed to determine historic exposures from DOE operations; however, the retention properties of the clay soils would provide an indication of the presence of some of the elements from any past releases. The evaluation of emissions on the Scarboro Community from other industrial operations was likewise not part of the study design.

Analytical results from these samples were compared with the analytical data collected by DOE. None of the EPA radionuclide analytical values exceeded normal background levels, Maximum Concentration Limits (MCLs) or Preliminary Remediation Goals (PRGs) that may indicate a health concern. None of the mercury samples were above the MCL or PRG. The National Secondary Drinking Water Standard (NSDWS) and PRG levels were exceeded for aluminum, iron and manganese in a few water, sediment and soil samples. However, aluminum, iron and manganese are naturally occurring in the geologic area of Oak Ridge, indicating that these are not related to releases from DOE operations and do not in any case present a health risk. All other metals were undetected or below the MCLs, NSDWSs, or PRGs. EPA conducted core sampling to determine the presence of uranium at depth. There is no evidence that the substance is present at levels 12 inches below ground surface.

The samples were to have been analyzed for lithium. However, lithium analysis was not conducted by the laboratory. In order to evaluate the possible presence of lithium in the samples collected by EPA, the laboratory Lithium Internal Standard for trace metal analysis was used. This evidence indicates that there is little if any lithium present in the samples collected by EPA. Since the values did not exceed the allowable levels based on sample recovery, there is no indication that lithium was present in the analyzed samples at levels that would warrant concern.

No volatile organic compounds (VOCs) were detected in the EPA and DOE surface water samples. VOCs detected in the sediment/soil samples were attributed to sampling or laboratory activities. All pesticide/PCBs were undetected or below the MCLs for the EPA and DOE surface water samples. The semi-volatile organic compounds (SVOCs) detected in one or more of the surface water, sediment, or soil samples were phthalates (pronounced tha-lates). Their presence is based on the analytical detection limits and are commonly used as plasticizers or softening agents in laboratory tubing, sampling equipment, etc. These are associated with laboratory artifacts and not related to the environmental samples collected by EPA.

The analytical results of the 2001 EPA sampling effort was consistent with the 1998 DOE sampling. The EPA study concludes that the residents of Scarboro are not currently being exposed to substances that pose an unreasonable risk to health or the environment. The soil, sediment and water quality in this community does not pose a risk to human health and the environment. The EPA does not propose to conduct any further environmental sampling in the Scarboro Community unless such work is needed as part of future studies within the entire Oak Ridge community.

SEPTEMBER 2001 SAMPLING REPORT
FOR THE SCARBORO COMMUNITY
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SESD PROJECT No. 01-1222

FINAL REPORT

1.0 PROJECT BACKGROUND

Beginning in 1997, the Scarboro Chapter of the National Association for the Advancement of Colored People (NAACP) contacted the United States Environmental Protection Agency (EPA) with concerns that the community was possibly being exposed to emissions from the Y-12 plant located at the Department of Energy-Oak Ridge Reservation (DOE) and as a result could be experiencing negative health impacts. The Y-12 plant began operations in 1943

and primarily produced enriched uranium-235 by an electromagnetic process. Current operations include disassembling nuclear weapon components, processing nuclear materials and performing other functions that relate to energy and the United States nuclear weapons defense programs. The Y-12 plant is now operated as part of the DOE National Nuclear Security Administration. However, any environmental management activities will be coordinated with the DOE Office of Environmental Management.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was signed into law in 1980 and requires the “cleanup, and emergency response for hazardous substances released into the environment and the cleanup of inactive hazardous waste disposal sites.” The worst sites that pose an unreasonable risk to human health and the environment are placed on the National Priorities List (NPL). This means that these sites will require long-term remedial investigation and cleanup activity. In 1989 the entire DOE Oak Ridge Reservation was placed on the NPL. Section 120 of CERCLA specifically addresses federal facilities. By definition, the “lead agency” is required to implement CERCLA. As lead agency, DOE is to conduct environmental investigations of releases and exposures to releases that occur both on and off the reservation that result from its operations. The EPA urged DOE to investigate the allegations made by the residents of the Scarboro community.

In May 1998, the DOE responded to the concerns of the citizens by collecting samples from 48 locations in the Scarboro community. Samples were collected from 40 soil and 8 sediment and/or surface water sites. The EPA did not receive the DOE sampling and analysis plan for review prior to its implementation nor was EPA able to participate in the DOE field sampling. Therefore, as part of its oversight responsibilities, the EPA developed a draft sampling plan in July 1999. The document, *“EPA Proposed Sampling and Analysis Plan for the Scarboro Community,”* was presented to the Oak Ridge Site Specific Advisory Board at its September 1, 1999 meeting. The public comment period was initiated at this meeting. The EPA solicited and received comments from the Oak Ridge community-at-large. Six (6) comments were received.

2.0 PROJECT SCOPE

The purpose of the EPA sampling event was to re-sample 20% of the 1998 DOE sampling locations. This sampling activity was considered a screening and not a full remedial investigation of the Scarboro community. The results of these samples were to be compared to those collected by DOE. By comparing the results, EPA would: 1) verify the 1998 chemical, metal, and radiological data set collected and analyzed by DOE, 2) identify any substance(s) not analyzed by DOE and evaluate those analytical data gaps, 3) determine the source(s) of uranium and other radionuclides, and 4) evaluate whether unreasonable risk to human health may be present.

Exposures that resulted from historic releases and ecological impacts were not included in the scope of this project. The evaluation of exposures to historic releases and any adverse health effects is the responsibility of the Agency for Toxic Substances and Disease Registry (ATSDR) and also evaluates human health exposures at all CERCLA NPL sites. This federal agency, located within the United States Department of Health, is currently conducting a public health

assessment by evaluating exposure and subsequent impacts from releases, including historic, in the Oak Ridge area. The Tennessee Department of Health(TDH), through the final report of the Oak Ridge Health Assessment Steering Panel (ORHASP) evaluated past releases and the potential impact for exposure. This information is detailed in their 1999 report titled, *"Releases of Contaminants from Oak Ridge Facilities and Risks to Public Health."* This document presents eight specific recommendations that relate to public health in consideration of follow-up activities.

Prior to implementing its project, the EPA solicited comments from DOE, the Tennessee Department of Environment and Conservation (TDEC), the Oak Ridge Site Specific Advisory Board (ORSSAB), the Oak Ridge Local Oversight Committee (LOC), and other interested parties and stakeholders. Although some comments from the community desired the EPA to expand the scope of its sampling effort, expanding the sampling to include other communities was outside the scope and role related to the initial concern expressed by the NAACP.

On September 25, 2001, representatives of the EPA collected a total of 10 environmental samples from 8 separate properties within the Scarboro Community. Verbal and/or written consent from property owners or occupants was obtained prior to sampling. The samples consisted of soil, sediment and surface water. The EPA sampling investigation was performed by the Region 4, Science and Ecosystem Division (SESD), Enforcement Investigation Branch (EIB) personnel. Sample sites were selected based on: 1) the May 1998 DOE study, 2) the reconnaissance performed in February 23, 1999 by SESD-EIB personnel, and 3) information gathered during the February 1999 and September 2001 public meetings held in Oak Ridge.

3.0 SITE BACKGROUND

The Scarboro Community is located about 1,500 feet northwest and along the boundary of the Department of Energy(DOE), Oak Ridge Reservation (ORR). It is the nearest residential community to active DOE operations or property. This small, urban, minority community occupies about 250 acres and is located in east Oak Ridge. The community is bounded to the west by East Fork Ridge and to the east by Pine Ridge (Figure 1). The topography consists of gently rolling hills that have been cleared for residential use.

4.0 SAMPLING LOCATIONS

Figure 2 identifies the EPA and DOE sampling locations. All samples were collected and handled in accordance with the United States Environmental Protection Agency, Region 4, Science and Ecosystem Support Division, Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, May 1, 1996. This document explains the procedures for sample collection to verify the quality of sampling activities. The precision, comparability and accuracy of sample analysis is addressed in the United States Environmental Protection Agency, Region 4, Science and Ecosystem Support Division, Analytical Support Branch Operations and Quality Control Manual, December, 1997.

For comparison purposes, EPA selected 6 of the 48 DOE sample locations where full analytical scans were conducted. The sample numbers for these 6 locations were: SCS SS 037,

SCS SS 038, SCS SS 039, SCS SS 040, SCS SD 001 and SCS SW 001. Due to access restrictions, sample location SCS SS 039 was deleted and substituted with sample location SCS SS 020. Based on the DOE results for mercury and/or radiation, EPA also targeted sample locations SCS SS 005, SCS SS 029, SCS SD 007 and SCS SW 005 for re-sampling. Due to access restrictions, SCS SS 005 was deleted from the original list and substituted with sample location SCS EPA-01.

During the September 2001 EPA sampling event, a total of ten (10) environmental samples were collected. They consisted of six (6) surface soil samples identified as: SCS SS 020, SCS SS 029, SCS SS 037, SCS SS 038, SCS SS 040, and SCS SS EPA-01; two (2) sediment samples identified as: SCS SD 001 and SCS SD 007; and, two (2) surface water samples identified as SCS SW 001 and SCS SW 005. These samples were collected from nine (9) separate locations comprising eight (8) different properties within the Scarboro Community. A complete list of all EPA sample numbers, sample type and description of the sampling locations is provided in Table 1.

Air monitoring or air dispersion evaluation was not conducted as part of this study. Any concern regarding dispersion and/or air deposition was taken into consideration when the environmental samples were collected.

The geographic coordinates of the May 1998 DOE sampling locations were utilized as much as possible to identify where EPA would conduct its sampling activity. SESD-EIB personnel located all of the EPA September 2001 sample locations using the Global Positioning System (GPS). A Trimble Pathfinder Pro XL with realtime differential correction was used to collect the GPS data. Personnel from the EPA, Region 4, Office of Technical Services conducted a radiation walkover of the areas selected for sampling. The survey was performed using a Sodium Iodide detector and GM Pancake probe to identify the presence of uranium isotopes and other gamma-emitting isotopes.

5.0 SAMPLING METHODOLOGY AND PROTOCOLS

Personnel from the EPA, Region 4, Office of Technical Services conducted a qualitative screening walkover for radiation in areas selected for sampling to determine whether radiation existed above background levels. The survey was performed using a Sodium Iodide detector and GM Pancake probe to identify the presence of uranium isotopes and other gamma-emitting isotopes. Personnel from TDEC also conducted a walkover survey of some sample locations. The screening instruments did not detect radiation above background levels. However, samples were collected to determine the presence of radiation contaminants that could not be detected with a radiation screening tool. Samples were collected for analysis to determine if other contaminants of concern (primarily chemicals or metals) were also present.

5.1 Soils

A total of six (6) soil samples were collected as part of this study. EPA attempted to

duplicate as much as possible the protocols used during the May 1998 DOE sampling effort. The May 1998 DOE sampling interval was limited to 0-2 inches below land surface. However, because of the large amount of soil needed for each sample, the EPA samples were collected from 0-6 inches. The DOE did not conduct “uranium core” sampling. Soil sampling for the “uranium cores” was conducted by the EPA from 0-12 inches below land surface at two locations. These samples were collected at the request of local residents to determine if uranium isotopes could be found at depth.

Surface soil sampling consisted of using a pre-cleaned 3-inch diameter stainless steel hand auger to collect the soil samples from the interval of 0-6 or 0-12 inches. The sample was placed in a pre-cleaned glass or stainless steel bowl and thoroughly mixed with a stainless steel spoon. It is important to note that samples for VOCs were not homogenized prior to being placed into the sample container.

5.2 Sediment

Two (2) sediment samples were collected as part of this study. Because wading was possible in each surface water body, the sediment sample was collected with a stainless steel scoop or spoon. The sampler waded into the surface water body and faced upstream into the current. The sediment sample was scooped along the bottom and sides of the surface water body in the upstream direction. Excess water was removed from the mixing bowl and the sediment was homogenized.

5.3 Surface water

Two (2) surface water samples were collected as part of this study. The surface water samples were collected directly into the sample container because the surface water sources were accessible by wading or standing on the banks. The sampler faced upstream and collected the sample without disturbing the sediment. Surface water samples were always collected prior to a sediment sample at the same location. When necessary, a stainless steel scoop was used for reaching into the body of water to collect the surface water sample. The scoop was used directly to collect and transfer the surface water sample into the appropriate container. Samples were not filtered in the field. Analytical data from filtered samples can result in biased numbers that are lower because constituents are left on the filter paper.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

All samples were collected and handled in accordance with the United States Environmental Protection Agency, Region 4, Science and Ecosystem Support Division, Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, May 1, 1996. This document explains the procedures for sample collection to verify the quality of sampling activities. The precision, comparability and accuracy of sample analysis is addressed in the United States Environmental Protection Agency, Region 4, Science and Ecosystem Support Division, Analytical Support Branch Operations and Quality Control Manual, December, 1997.

6.1 Candidate Contaminants/Target Analyte and Compound List

The Candidate Contaminants/Target Analyte and Compound List of substances likely to be found were based on historical data and supplemented with process knowledge provided by the U.S. EPA, Region 4, Federal Facilities Branch. This data indicated that radionuclides and mercury were of concern to the Scarboro Community based on the proximity to the Oak Ridge Y-12 facility. For that reason, samples were analyzed by the EPA National Air and Radiation Environmental Laboratory (NAREL) located in Montgomery, Alabama for radionuclides, mercury, metals, volatile and extractable organic compounds, pesticides and PCBs. As part of the evaluation efforts, results from the May 1998 DOE and September 2001 EPA studies have been tabulated for review and comparison.

7.0 ANALYTICAL EVALUATION METHODOLOGY

The EPA samples were subjected to full analytical scan such as inorganic metals, volatile organic chemicals, semi-volatile organic chemicals, radiochemicals, and organochlorine pesticides and PCBs. Not all DOE samples were subjected to full scan. To evaluate the results, EPA used a variety of guidance documents and standards to compare the results. The primary references used in the evaluation of the sample media consist of the following:

7.1 Safe Drinking Water Act (surface water)

The Safe Drinking Water Act (SDWA) has two major components that are used to control the level of contaminants in the nation's drinking water. The *National Primary Drinking Water Regulation* (NPDWR) is legally enforceable, applies to public water systems and limits the levels of approximately 30 specific contaminants that are known or occur in water. The primary standards are the Maximum Concentration Limit (MCL). The MCL is a value that correlates to a specific contaminant to protect groundwater when used as a drinking water source. EPA obtained the MCL values from the EPA Office of Water homepage and were downloaded on September 7, 2001. The homepage can be accessed at: <http://www.epa.gov/OGWDW/mcl.html#mcl>.

For surface water samples, the EPA used the MCLs since these values, where they exist, are health protective levels. The values are given in mg/L but were changed to ug/L to reflect the reporting units of the analytical data. EPA used the drinking water standards to evaluate all metals in surface water, including mercury. However, for mercury, (Table 6), the 2 ug/L value was used and derived from the drinking water standards as of October 16, 2001.

In addition, the MCL was also used to compare the radionuclide values measured in surface water samples. Please see Table 3.

The *National Secondary Drinking Water Regulation* (NSDWR) is a non-enforceable

guideline, with standards that describe the cosmetic effects a contaminant may have on the quality of water such as taste, odor, color, effect, on the skin, etc. Some states may adopt these regulations as enforceable. Some metals have values that are also referenced in this standard.

7.2 Preliminary Remediation Goals (soils and sediment)

For soil and sediment samples other than radionuclides, the EPA used the Region 9 Preliminary Goals (PRGs) table. These are risk-based values used for site soil screening (not action levels) at contaminated sites. It should be noted that background soil concentrations were not considered in this evaluation. The PRG is a number that represents the lowest risk level (1×10^{-6}) of the CERCLA protective risk range (1×10^{-6} to 1×10^{-4}) for a cancer effect. For non-cancer toxicity, the PRG represents the HI value of 1.0. The CERCLA risk range, used in the Superfund and Resource Conservation and Recovery Act programs, applies to carcinogens and represents the increased additive chance of developing cancer over a 30 year exposure period. If the measured value did not exceed the PRG, there is no health concern. If the measured value exceeded the PRG but not exceed the upper end of the CERCLA risk range (1×10^{-4}), there also is no health concern. The Region 9 PRG table, which is updated periodically, can be accessed at: <http://www.epa.gov/region09/waste/sfund/prg/index.htm>. For radionuclides, the PRG values were taken from the website: <http://epa-prgs.ornl.gov/radionuclides/>, as of April 15, 2002.

7.3 Hazard Quotient/Hazard Index (HQ/HI)

The HQ/HI is a ratio of the exposure level in units per kilogram of body weight per day for a single toxic substance to the reference dose (the dose without toxicity) of that substance over the same exposure period. The HI is the sum of all HQ values from all toxic substances that a receptor is exposed to from a common source. A HQ or HI less than 1.0 indicates that the exposure is not sufficient to yield a health concern for a lifetime of daily exposure. A lifetime is estimated as 70 years. HQ/HI values greater than 1.0 do not indicate a health hazard exists but rather, further evaluation is warranted. Reference doses are considered to have an order of magnitude of uncertainty.

7.4 Radionuclide Methodology

7.4.1 Gamma Spectroscopy

The gamma isotopes that were chosen to be analyzed are similar to Potassium 40 (K-40) in that they are either naturally occurring and non site-related or part of background from global fallout, which includes uranium. Gamma spectroscopy was used as a screen. It was chosen to analyze gamma emitting isotopes which indicate radioactive decay. Table 3 identifies those isotopes chosen for this study.

7.4.2 Gross Alpha/Gross Beta

The main purpose for analyzing gross alpha/beta is for screening to determine if individual radionuclides should be sampled. It is not used for quantification. If a value did exceed the MCL for surface water, then the laboratory protocol would require an isotopic analysis. There are no standards to compare gross measurements in soil or sediment.

7.5 Exception to the Draft Report

Lithium was not analyzed as indicated in the “Combined List of Chemical and Radionuclide Contaminants Analyzed for in Environmental Samples from the Scarboro Community, Oak Ridge, Tennessee,” which was made available to the public at the November 14, 2002, EPA Public Availability Sessions. In order to evaluate the presence of lithium in the samples collected by EPA, the laboratory Lithium Internal Standard for trace metal analysis was used as evidence that there is little, if any, lithium present in the samples collected by EPA. The Internal Standard is added during each analysis at 50ug/L, which is equivalent to 5 mg/kg dry weight basis (assuming 100% solids, 0.5 g sample size, and 50 ml final volume). Lithium and Scandium are both trace metal analysis used as Internal Standards by the EPA laboratory. Tables 13-15 show the Lithium Internal Standard counts for all standards, blanks, samples, etc. in the analytical sequence on the day the Scarboro samples were analyzed.

Using the Initial Calibration Blank as a reference value, the data shows that the Lithium Internal Standard counts varied from a low of 93.9% to a high of 119.7%. The acceptance criteria for Internal Standard recovery is 80-120%. The data shows the Scandium Internal Standard counts vary from 91.9% to 118%. The chart also shows that the lithium and scandium recoveries tracked the same trendline. The trendlines appear to fall within the allowable percentage of analytical error for lithium for each medium analyzed. This indicates that the drift or changes in the Lithium Internal Standard counts is primarily due to minor changes in instrument sensitivity and can not be certain that lithium is/is not present in the sample.

8.0 ANALYTICAL RESULTS SUMMARY

The EPA samples were subjected to full analytical scan. The EPA found that none of the EPA radionuclide analytical values exceeded normal background levels, nor were any of the samples above the MCLs or PRGs. None of the samples were above the MCL or PRG for the metal mercury. The NSDWS value for aluminum, iron and manganese was exceeded in one or more water samples. The PRG for iron and manganese was exceeded in one or more of the sediment/soil samples. Aluminum, iron and manganese are naturally occurring substances in the geologic formation of the Oak Ridge area. The naturally occurring substances were found at levels that do not present a concern for health or the environment. All other metals were undetected or below the MCLs, NSDWSs, or PRGs.

No volatile organic compounds (VOCs) were detected in the EPA and DOE surface water samples. No VOCs were detected in VOC trip blank or in the laboratory blanks. VOCs detected in the sediment/soil samples were identified as plasticizers, solvents and/or column artifacts and are generally attributed to sampling/laboratory activities. Although detected, there

was no further consideration given to the results.

All pesticide/PCBs were either undetected or below the MCLs in both the EPA and DOE surface water samples. The compounds alpha and gamma chlordane, heptachlor, DDE-p,p' and DDT-p,p', heptachlor epoxide were detected in one or more of the sediment/soil samples. Chlordane was used for termite control several years ago. Heptachlor has also been used for termite control, with the epoxide version being a degradation product which can act as an insecticide. DDE is a degradation product of DDT, which was used as an insecticide/pesticide. The presence of pesticides at or above detectable levels indicate possible past wide-use by the homeowner or resident. Although detected but not considered site- related, no further consideration was given to these results.

The semi-volatile organic compounds (SVOCs) detected in one or more of the surface water/ sediment/soil samples were phthalates, which are commonly used as plasticizers or softening agents in laboratory tubing, sampling equipment, etc. Although detected but not considered site- related, no further consideration was given to these results.

9.0 DISCUSSION OF ANALYTICAL RESULTS

Tables 2 through 10 contain data summary comparisons of the EPA and DOE analytical results. For ease in finding uranium, gamma, and strontium results for specific properties, the corresponding letters A through J have been assigned in Table 1 to reflect each property sampled, respectively. These letters are used in identifying Tables 2 through 4. The values of pCi/gdry are comparable to pCi/g.

For radionuclides, gamma spectroscopy and gross alpha/gross beta were used as screens. The quantitation values for uranium and strontium are provided for the respective sampled media.

9.1 Radionuclide

9.1.1 Gamma Spectroscopy - Table 3

Gamma Spectroscopy was used as a screening. Table 3 identifies the isotopes selected for this study. The analysis of the information reveals that all results for gamma emitters were within their predicted background ranges for the United States and Oak Ridge-wide. None of the analytical values were elevated above background. Uranium is both naturally occurring and site-related. However, as noted previously, none of the EPA values were above the PRG or background.

9.1.2 Gross Alpha/Gross Beta - Table 5

The main purpose for analyzing gross alpha/beta is for screening to determine if individual radionuclides should be sampled. This was accomplished through the gamma spectroscopy.

9.1.2.1 Surface Water

The MCL for gross alpha is 15 pCi/L. Neither of the two surface water samples for the EPA or DOE samples exceeded this limit. The MCL for gross beta is 4mR/yr or 50 pCi/L. Neither EPA or DOE samples exceeded this limit.

9.1.3 Uranium - Table 2

9.1.3.1 Surface Water

The MCL for uranium in drinking water is 30 ug/L. None of the EPA or DOE samples exceeded this limit.

9.1.3.2 Sediment

The PRG for U-234 is 4.01pCi/g, U-235 is 0.205 pCi/g, and U-238 is 4.46 pCi/g, respectively. Uranium is both naturally occurring and site-related. Maximum levels for U-234, U-235, and U-238 are 1.11, 0.138, and 1.27 pCi/g, respectively. None of the analytical values were elevated above U.S. or Oak Ridge background levels nor exceeded the PRGs level.

9.1.3.3 Soil

The PRG for U-234 is 4.01 pCi/g, U-235 is 0.205 pCi/g , and U-238 is 4.46 pCi/g, respectively. Uranium is both naturally occurring and site-related. The maximum levels measured for U-234, U-235, and U-238 are 1.49, 0.126, and 1.44 pCi/g, respectively. None of the analytical values, including those for the uranium cores, were elevated above the PRG or background.

9.1.4 Strontium-89/90 - Table 4

9.1.4.1 Surface Water

The MCL is 8 pCi/L. No values exceeded the MCL.

9.1.4.2 Sediment/Soil

The EPA and DOE samples were non-detectable, and thus, below background and the PRGs for strontium-89 and strontium-90 (Sr-89, Sr-90). The Sr-90 background value from global fallout for the Oak Ridge area and the U.S. is approximately 1 pCi/g. Sr-89 would not be expected in any results due to its' half life of 50 days.

9.1.5 Background for Radionuclides

For purposes of this report, the background levels and PRGs for screening soil in a residential scenario were used to screen potential radioactive contamination. Radionuclides, both

natural and from global atmospheric fallout can commonly be higher than the PRGs. Examples include: the background for Cs-137, which is approximately 1.0 pCi/g, yet the PRG for residential soil is 0.06pCi/g; the background for U-238 + D (decay products) is approximately 0.2 - 3.8 pCi/g, yet the PRG is 0.74 pCi/g. Based on EPA's risk assessment guidance, if the radionuclide is less than 2X background, then the radionuclide should be eliminated as a contaminant of potential concern (COPC). Background levels of Uranium around Oak Ridge, and in the U.S., have consistently ranged up to 3 pCi/g. Please see Table 11.

Potassium-40 is a naturally occurring radionuclide that is never considered site-related. Although, Potassium-40 has a PRG, just as all radionuclides, it is always eliminated whenever considering site-related risks and potential remedial actions. Though the levels for Potassium-40 are over the PRG, the residential PRG [1×10^{-6}] is very low compared to the natural background [0.1 pCi/g] and all levels are within 2X background. The Potassium-40 levels are within the predicted U.S. background levels of 3-20 pCi/g or slightly exceed it. In most cases, higher Potassium-40 levels are due to fertilizer related to farming, though there may be some attributed to the TVA Bull Run facility. The overall radiation risk/dose from soil or terrestrial exposure is a large component for natural background [about a third] of which Potassium-40, Uranium, and Thorium are major contributors. The lifetime risk of overall natural radiation background is over 1×10^{-3} . Potassium-40 is a strong gamma and beta emitter. It is never considered a site-related contaminant and is not carried forward as a COPC at any site.

Radium-226/228 are known to have high background in most soil in the U.S. ranging from 0.2 to approximately 4.2 pCi/g. The PRGs for these are below background levels (0.01 and 0.07 pCi/g) respectively for residential scenarios. Thus, the risk for radium at natural background levels exceed 1×10^{-4} risk in any U.S. soil. Please see Table 11 for additional information on background.

The lead (Pb-212) level in surface water does not exceed the its PRG for tap water. Yet, due to its' short half-life, 10 hours, Pb-212 does not have a MCL and is part of the decay products of radium which does have MCL. Pb-212 is not normally listed separately in an analysis; however, it is part of the laboratory gamma software package and is automatically included in the results.

EPA identified specific substances be analyzed. However, due to the software package used by the laboratory, many more results of analysis are reported and are included in the results than requested.

9.1.6 Uranium Enrichment

The uranium results showed uncertainty of uranium enrichment due to the level of the uranium isotopes being at background levels and/or detection limits and uncertainty. The uranium-235 measurements, in particular, had results where the uncertainty was greater than the value measured. Therefore, determining uranium enrichment is uncertain as well. If there is some uranium enrichment potentially in the uranium isotopes in the Scarboro soil and sediment, the actual levels of uranium isotopes are still within the U.S. and Oak Ridge background ranges. Please see Table 12.

9.2 Metals - Table 7

9.2.1 Surface Water

All other metals were undetected or below the MCLs or NSDWSs with the exception of the following:

Mercury - Table 6 contains the analytical comparison for mercury only. The MCL is 2 ug/L. The surface water values for mercury were undetected in the two 2001 EPA samples and in the two 1998 DOE samples.

Aluminum - The NSDWS of 50-200 ug/l was exceeded for aluminum in EPA sample SCS SW 005 with 1030 ug/L. The NSDWS for aluminum was also exceeded in both the EPA and DOE sample SCS SW 001 with 1640 and 261 ug/l, respectively. This is a naturally occurring substance considering the geologic formation of the Oak Ridge area.

Iron - The NSDWS of 300 ug/l for iron was exceeded in EPA sample SCS SW 005 with 769 ug/l and in the EPA and DOE sample SCS SW 001 with 1160 and 565 J ug/l, respectively. This is a naturally occurring substance considering the geologic formation of the Oak Ridge area.

Manganese - The NSDWS of 50 ug/l for manganese was exceeded in EPA and DOE sample SCS SW 001 with 65.5 and 292 ug/l, respectively. Manganese is naturally occurring, considering the geologic regime or formations of Oak Ridge area. The levels do not reflect a level of health concern.

9.2.2 Sediment

All metals were undetected or below the PRGs except the following:

Arsenic - The PRG of 0.39 mg/kg was exceeded in both samples. The values measured were 1.62 mg/kg and 5.17 mg/kg for samples SCS SD 001 and SCS SD 007, respectively.

Mercury - None of the sediment samples for mercury were above the PRG of 23 mg/kg. Sediment values for mercury in the EPA samples ranged from 0.0271 B to 0.0904 mg/kg and ranged from 0.035 to 0.17 mg/kg in the DOE samples.

Iron - The PRG of 23,000 mg/kg for iron was exceeded in DOE sample SCS SD 001 with 23,900 mg/kg. All other metals were undetected or below the PRGs. This is a naturally occurring substance considering the geologic formation of the Oak Ridge area. The levels do not reflect a level of health concern.

9.2.3 Soil

All metals were undetected or below the PRGs except the following:

Arsenic - The PRG of 0.39 mg/kg was exceeded in both samples. The values measured were 5.64 mg/kg, 3.66 mg/kg, 4.68 mg/kg and 6.39 mg/kg for samples SCS SS 020, SCS SS 029, SCS SS 037, and SCS SS 038, respectively. Two samples were greater than the instrument detection limit but less than the reporting limit.

Mercury - None of the soil samples for mercury were above the PRG of 23 mg/kg. Soil values in the EPA samples ranged from 0.0271 B to 0.0904 mg/kg and ranged from 0.035 to 0.17 mg/kg in the DOE samples.

Iron - The PRG of 23,000 mg/kg for iron was exceeded in EPA sample SCS SS 037 with 23,100 mg/kg, in EPA sample SCS SS 020 and in EPA sample SCS SS 029 with 25,400 mg/kg. This is a naturally occurring substance considering the geologic formation of the Oak Ridge area.

Manganese - The PRG of 1800 mg/kg for manganese was exceeded in EPA sample SCS SS 037 with 1930 mg/kg. This is a naturally occurring substance considering the geologic formation of the Oak Ridge area.

9.2.4 Exception to the draft Report

Lithium - The laboratory results could not support a positive presence of lithium in the samples collected by EPA. However, based on the analytical margin of error, there appears to be no level of health concern. Please refer to Tables 13-15 for additional information.

9.3 Volatile Organic Compounds - Table 8

9.3.1 Surface Water

No VOCs were detected in the EPA and DOE surface water samples. No VOCs were detected in VOC trip blank or in the laboratory blanks.

9.3.2 Sediment

Four (4) VOCs were detected in EPA sample SCS SD 001. These were: cyclotetrasiloxane at 27.4 NJ ug/kg, benzoic acid at 206 NJ ug/kg, acetic acid at 10.8 NJ ug/kg and dodecane at 7.4 NJ ug/kg. These compounds are plasticizers, solvents and/or analytically related and are generally attributed to sampling/laboratory activities. There are no PRGs established for these substances. The detection qualifiers were identified as “NJ” which means the laboratory analysis presumed the material was present, based on analytical detection limits, but at estimated values. Therefore, no further evaluation was conducted on the sample.

Acetone was detected at 11.5 ug/kg in the trip blank (QA 901 TB), along with 38.9 NJ ug/kg benzoic acid and 6.9 NJ ug/kg 3-methylheptyl acetate. These three compounds are

common sampling/laboratory products. The detection qualifiers were identified by the laboratory as “NJ” which means the laboratory analysis presumed the material was present, based on analytical detection limits but at estimated values. Therefore, no further evaluation was conducted on the sample.

No VOCs were detected in the laboratory blanks.

9.3.3 Soils

One (1) VOC, benzoic acid, was detected in EPA sample SCS SS 020 at 82.4 NJ ug/kg. One VOC, 1R-alpha-pinene, was detected in EPA sample SCS SS 029 at 45.0 NJ ug/kg. Pinene is derived from pine tree resin. The detection qualifiers were identified by the laboratory as “NJ” qualified which means the laboratory analysis presumed the material was present, based on analytical detection limits, but at an estimated value. Therefore, no further evaluation was conducted on the sample.

Three VOCs were detected in EPA sample SCS SS EPA-01. These were: cyclotetrasiloxane at 49.6 NJ ug/kg, benzoic acid at 111 NJ ug/kg and acetic acid at 9.1 NJ ug/kg. EPA sample SCS SS 037 had 8.8J ug/kg benzene ethanamine. The detection qualifiers were identified by the laboratory as “NJ” which means the laboratory analysis presumed the material was present, based on analytical detection limits, but at estimated values. Therefore, no further evaluation was conducted on the sample.

EPA sample SCS SS 038 had 15.9 NJ ug/kg cyclotetrasiloxane, 98.1 NJ ug/kg benzoic acid and 8.8 NJ ug/kg acetic acid detected. The detection qualifiers were identified by the laboratory as “NJ” which means the laboratory analysis presumed the material was present, based on the analytical detection limit, but at estimated values. Therefore, no further evaluation was conducted on the sample.

EPA sample SCS SS 040 had 63.2 NJ ug/kg cyclotetrasiloxane, 123 NJ ug/kg benzoic acid and 16.7 NJ ug/kg acetic acid. These compounds are plasticizers, solvents and/or column artifacts and are generally attributed to sampling/laboratory activities. The detection qualifiers were identified by the laboratory as “NJ” which means the laboratory analysis presumed the material was present, based on analytical detection limits, but at estimated values. Therefore, no further evaluation was conducted on the sample. .

No VOCs were detected in the laboratory blanks.

PRG values have not been established for all substances. The following chart compares PRG values, where they exist, for the VOC detections. The Chemical Abstract Service Number (CAS #) is listed as a reference.

VOLATILE ORGANIC COMPOUNDS

CAS #	Compound	PRG	PRG
		residential soil	tap water
556-67-2	octamethylcyclotetrasiloxane	NA	NA
72218-58-7	3 methylheptylacetate	NA	NA
3789-85-3	benzoic acid, 2-[trimethyl	NA	NA
103-09-3	acetic acid, 2ethylhexyl ester or 2 ethylhexyl acetate	NA	NA
112-40-3	dodecane	NA	NA
7785-70-8	IR-alpha-pinene	NA	NA
55429-85-1	benzene ethanamine,N[penta	NA	NA
76-64-1	acetone	1.6E+03	6.1E+02

NA = Not available from the U.S. EPA Region 9 October 2002 PRG table given at:
<http://www.epa.gov/region09/waste/sfund/prg/index.htm>.

9.4 Pesticide/PCBs - Table 9

9.4.1 Surface Water

All pesticide/PCBs were undetected or below the MCLs for the EPA and DOE surface water samples.

9.4.2 Sediment

No pesticide/PCBs were detected in EPA or DOE sample SCS SD 007.

Alpha-chlordane was detected in EPA and DOE sample SCS SD001 at 0.50J ug/kg and 2.0 I ug/kg, respectively. Gamma-chlordane was also detected at 0.75 J ug/kg and 1.7 I ug/kg, respectively. PRGs have not been established alpha-chlordane or gamma chlordane. These substances are not site-related and are not considered for further evaluation.

No pesticide/PCBs were detected in the laboratory blank.

9.4.3 Soils

No pesticide/PCBs were detected in EPA or DOE samples SCS SS 029 or SCS SS 040. No pesticide/PCBs were detected in EPA sample SCS EPA 001.

Alpha-chlordane, gamma-chlordane and heptachlor were detected in EPA sample SCS SS 020 at 14 ug/kg, 30 ug/kg and 13 ug/kg, respectively. PRGs have not been established for alpha-

chlordanes or gamma chlordanes. Samples collected from this location were not analyzed for pesticide/PCBs during the 1998 DOE sampling event. These substances are not site-related and are not considered for further evaluation.

No pesticide/PCBs were detected in EPA sample SCS SS 037. However, DDE-p,p' and DDT-p,p' (DDE and DDT derivatives) were detected in the sample collected during the DOE sampling event at concentrations of 1.7 I ug/kg and 2.0 I ug/kg. These substances are not site related and are not considered for further evaluation.

Alpha-chlordane was detected in both the EPA and DOE sample collected at SCS SS 038 at 11 ug/kg and 1700 ug/kg, respectively. Gamma-chlordane was detected in both the EPA and US DOE sample collected at SCS SS 038 at 12 ug/kg and 2800 ug/kg, respectively. Heptachlor was detected in DOE sample SCS SS 038 at 190 ug/kg, but not in the EPA sample. Heptachlor epoxide was detected in both the EPA and DOE sample location SCS SS 038 at 11 ug/kg and 970 ug/kg, respectively. These substances are not site-related and as such are not considered for further evaluation. No pesticide/PCBs were detected in the laboratory blank

Chlordane was used as a termite control for many years, but was banned in 1988. Heptachlor has also been used for termite control, with the epoxide version being a degradation product which can act as an insecticide. DDE is a degradation product of DDT, which was used as an insecticide and pesticide. Agricultural use of DDT was prohibited in 1973 in the US because it was not biodegradable and had damaging ecological affects. The presence of the pesticide products is probably due to wide-use by the resident or homeowner.

PRG values have not been established for all substances. The following chart compares PRG values, where they exist, for the pesticide/PCB detections. The Chemical Abstract Service Number (CAS #) is listed as a reference.

PESTICIDE/PCB COMPOUNDS

CAS #	Compound	PRG	PRG
		residential soil	tap water
5103-71-9	alpha chlordane or cis-chlordane	NA	NA
5103-74-2	gamma chlordane or trans-chlordane	NA	NA
76-44-8	heptachlor	1.1E-01	1.5E-02
72-55-9	DDE-p,p'	1.7E+00	2.0E-01
50-29-3	DDT-p,p'	1.7E+00	2.0E+00
1024-57-3	heptachlor epoxide	5.3E-02	7.4E-03

NA = Not available from the U.S. EPA Region 9 October 2002 PRG table given at:
<http://www.epa.gov/region09/waste/sfund/prg/index.htm>.

9.5 Semi-Volatile Organic Compounds - Table 10

9.5.1 Surface Water

No SVOCs were detected in EPA or DOE sample SCS SW 001. Butyl benzyl phthalate, di-n-butyl phthalate and dibutyl phthalate were detected in EPA sample SCS SW 005 at 15.8 ug/l, 11.7 ug/l and 31.4 NJ ug/l, respectively. Phthalates are commonly used as a plasticizer in tubing and are assumed to be part of the laboratory sampling effort. These substances are related to laboratory artifacts, are not site-related and are not considered for further evaluation. An unknown compound was also detected in this sample at a value of 15.1 J ug/l. This sample location (SCS SW 005) was not analyzed for SVOCs during the DOE sampling event. No SVOCs were detected in the EPA laboratory blank.

9.5.2 Sediment

No SVOCs were detected in EPA sample SCS SD 007. This sample location was not analyzed for SVOCs during the DOE sampling event. In sample SCS SD 001, SVOCs were not detected during the DOE sampling event, but di-n-butyl phthalate was detected at 544 J ug/kg during the EPA sampling event. Phthalates are commonly used as a plasticizer in tubing and are assumed to be part of the laboratory sampling effort. These substances are related to laboratory artifacts, are not site related and are not considered for further evaluation. SVOCs were not detected in the laboratory blank.

9.5.3 Soils

SVOCs were not detected in EPA samples SCS SS 020, SCS SS 029, SCS SS 037, SCS SS EPA-01 or in the laboratory blank. Samples from locations SCS SS 220, SCS SS 029 and SCS SS 037 were not analyzed for SVOCs during the 1998 DOE sampling event.

Fluoranthene, which is derived from coal tar, was detected in DOE samples SCS SS 038 and SCS SS 040 at values of 4 I ug/kg and 87 I ug/kg, respectively. However, this compound was not detected during the EPA sampling analysis and is not considered site-related.

The following chart compares PRG values for the SVOC compound detections. The Chemical Abstract Service Number (CAS #) is listed as a reference.

SEMI-VOLATILE ORGANIC COMPOUNDS

CAS #	Compound	PRG	PRG
		residential soil	tap water
85-68-7	butyl benzyl phthalate	1.2E+04	7.3E+03
84-74-2	di-n-butyl phthalate	6.1E+03	3.6E+03
206-44-0	floranthene	2.3E+03	1.5E+03

NA = Not available from the U.S. EPA Region 9 October 2002 PRG table given at:
<http://www.epa.gov/region09/waste/sfund/prg/index.htm>.

10.0 POTENTIAL CHEMICAL AND RADIATION RISK

The results of this analysis did not reveal any toxic chemicals at levels of health concern. Detection limits for some of the semi-volatile organic compounds were greater than the risk screening level but not greater than the regulatory health concern level. Although some chemicals had detection limits that slightly exceeded the PRGs, none are known to be site-related.

Arsenic, iron and manganese exceeded their respective PRG. Neither iron or manganese are cancer causing substances. Arsenic has both carcinogenic and non-cancer causing health effects. The toxicity of non-carcinogens is evaluated by determining a Hazard Index (HI). A HI value above 1.0 indicates that an assumed exposure level could be above the protective level for a given toxic substance. The HI values for the levels of iron and manganese in the Scarboro samples were all below 1.0. The HI value for arsenic did exceed the HI of 1.0. The carcinogenic PRG for arsenic was exceeded. However, the value did not exceed the CERCLA protective risk range (1×10^{-4}) for its carcinogenic effects. EPA Region 4 policy states "Arsenic is a naturally occurring mineral considered by EPA to be a systemic toxicant and a human carcinogen. However, there is considerable uncertainty concerning its ability to cause cancer at low exposure levels, especially the less soluble form that occurs in contaminated soil. The Superfund program of Region 4 regulates arsenic in soil as a systemic toxicant in deriving protective cleanup levels. As an additional precaution, EPA also requires soil cleanup levels to fall within the CERCLA protective cancer risk range for the most sensitive likely receptor." Table 14, Comparison of Chemical Exceedences, provides additional information on these exceedences. For additional information on chemical PRGs, please visit the EPA website at:
<http://www.epa.gov/region09/waste/sfund/prg/index.htm>.

PRGs for radionuclides may over estimate the upper-bound risk when actual exposure scenarios do not fit the default scenario used in developing the PRG. For example, a recreational exposure scenario would be appropriate for someone standing/fishing along the creek. The PRG developed for a residential soil exposure scenario would over estimate the risk by an order of a magnitude, due to the exposure duration being much greater for the residential than the recreational user. Appendix A contains an extract from the EPA web site for radionuclides and

can be found at: <http://epa-prgs.ornl.gov/radionuclides/> .

Since the results of analysis did not reveal elevated levels of chemical or radionuclide substances that warranted a health or environmental concern, a risk assessment was determined to be unnecessary and therefore was not conducted as part of this study.

11.0 CONCLUSIONS

The results of the EPA 2001 sampling campaign in the Scarboro community have been compared to the May 1998 sampling and analytical results conducted by DOE. The results of both the EPA and DOE sampling effort are consistent in their findings. There is not an elevation of chemical, metal, or radionuclides above a regulatory health level of concern. The EPA sample analysis supports that the Scarboro community is not currently being exposed to substances from the Y-12 facility in quantities that pose an unreasonable risk to health or the environment. The EPA does not propose to conduct any further environmental sampling in the Scarboro Community. If additional environmental information becomes available, EPA is proposing the procedures outlined in Section 12.0, Recommendations, be implemented.

12.0 RECOMMENDATIONS

EPA recognizes that the residents of Scarboro or the City of Oak Ridge may have future concerns regarding releases from DOE operations. In an effort to focus an approach that will address community concerns and provide appropriate feedback to the community, EPA is recommending the following actions:

- c) DOE should develop a written procedure to receive citizen and community complaints regarding discharges, emissions, or other releases originating from the Oak Ridge Reservation. The procedure should identify and provide for a timely response and followup action. Additionally, DOE should develop a communication strategy to inform the residents and other community members or stakeholders of its findings.
- d) If additional environmental information becomes available regarding Scarboro that warrants an investigation by DOE, the sampling plan, if developed, should be reviewed and approved by the EPA and TDEC, as regulatory oversight agencies to the Federal Facility Agreement (FFA).
- e) Any future health investigations conducted by DOE of the impacts of its operations on the Scarboro or the greater Oak Ridge community should be coordinated with the Oak Ridge Reservation Health Effects Subcommittee of the Agency for Toxic Substances and Disease Registry.
- f) Upon the release of recommendations by the Oak Ridge Health Effects Subcommittee to

the ATSDR, DOE, EPA, and TDEC with stakeholder involvement will scope the off-site (off DOE reservation) operable unit. The results of this activity will be the preparation of a Preliminary Assessment/Site Inspection, which is currently planned for September 30, 2005. This commitment is a DOE Federal Facility Agreement milestone.

13.0 REFERENCES

SESD-EIB Trip Report for the Scarboro Community, Oak Ridge, Tennessee;
SESD Project No. 01-1222, October 15, 2001.

ES-EIB Final Sampling and Analysis Plan for the Scarboro Community, Oak Ridge, Tennessee;
SESD Project No. 99-0351, July 9, 1999, distributed at the Scarboro Community Center,
September 1999.

Scarboro Community Environmental Study, U.S. DOE (distributed at the Scarboro Center,
September 22, 1998).

U.S. EPA Region 4 Science and Ecosystem Support Division, Analytical Support Branch
Operations and Quality Control Manual, (ASBOQCM December 1997).

U.S. EPA Region 4 Science and Ecosystem Support Division, Environmental Investigations
Standard Operating Procedures and Quality Assurance Manual (EISOPQAM May 1996).

U.S. EPA Analytical Data Sheets for the September 2001 Sampling of the Scarboro Community
in Oak Ridge, Tennessee.

14.0 Public Involvement and Outreach Activities

This section provides a summary of the public involvement and communication activities conducted by EPA for this project.

August 1998: EPA representatives toured the Oak Ridge community. Interviews were conducted with residents of the Scarboro community for the expressed purpose of obtaining information that would assist in identifying the specific environmental concerns raised by some of the community members.

February 23, 1999: Public meeting held with Scarboro community.

September 1, 1999: EPA presented the draft sampling plan to the Oak Ridge Site Specific Advisory Board. This began the public comment period on the document. Six (6) comments were received from the community and other interested stakeholders.

July 2001: The EPA finalized its sampling plan.

September 10-11, 2001: EPA held three public meetings prior to the actual EPA field sampling. These sessions were held at the Oak Ridge Mall and the Scarboro Community Center.

June 27, 2002: A summary of the EPA analytical findings issued to all property owners where samples were collected. The letters provided a narrative comparison of the EPA and 1998 DOE sample results and stated that the actual sampling results would be sent under separate cover.

July 2, 2002: EPA mailed the actual analytical results to the property owners. This communication also stated that a final report would be prepared and presented to the community.

September 25, 2002: EPA issues press release for the document titled, *"Draft Report September 2001 Sampling Report for the Scarboro Community, Oak Ridge, Tennessee"* with the public comment period ending on October 8, 2002. The document was mailed to each property owner, various community groups, the City of Oak Ridge, elected officials, and other state and federal agencies. In addition, the report was made available at the Scarboro Community Center, the Oak Ridge Library, and the DOE Information Center. The report was also made available on the EPA web site at: <http://www.epa.gov/region4/waste/fedfac/doeorr.htm>.

October 1, 2002: EPA representatives meet with property owners in the Scarboro community and explained the findings of the September 2001 sampling activity.

October 4, 2002: EPA extends the public comment period until November 22, 2002.

October 8, 2002: An overview of the EPA findings was presented at the regular meeting of the Local Oversight Committee.

October 9, 2002: EPA provided status of the public availability session at the regular meeting of the Oak Ridge Site Specific Advisory Board. EPA urged comments from the organization.

October 22, 2002: EPA announces the availability of the report and upcoming public availability sessions at the regular meeting of the Oak Ridge Reservation Health Effects Subcommittee.

November 14, 2002: EPA conducted two public availability sessions with the Oak Ridge community. A morning session was held at the Oak Ridge Mall; an evening session was held at the Scarboro Community. EPA holds press briefing prior to evening public availability session. Transcripts were taken of both sessions.

November 22, 2002: The public comment period officially ends on the EPA draft document.

January 2003: Planned release of the EPA final report; report delayed. Copies of the Public Availability transcripts were placed in the DOE Information Center and the Oak Ridge Public Library

May 13, 2003: EPA releases final report.

15.0 PUBLIC COMMENTS AND RESPONSIVENESS SUMMARY

NOTE: The responses address both written comments on the draft report and those captured in the transcripts of both November 14, 2002 Public Availability Sessions.

1. Commentor believes that EPA has not met the intended purpose of their study in the report, or corrected their negative statements in the newspaper, contributing to reputation of OR being grossly contaminated.

Response: The results of the EPA sampling activity and the revisions made to the draft report should assist in clarifying the basis of the environmental sampling.

2. EPA refuses to make a determination, to whether DOE's previous study results were valid nor make an definitive statement regarding whether Scarboro is contaminated or if residents are in any risk.

Response: The draft report states that the results of environmental sampling of both agencies "do not conflict," which indicates that there was nothing substantially different in the EPA and DOE results. The revised EPA report should clarify these concerns.

3. In Executive Summary (page v) EPA states that the plan was developed in response to community concerns. This is true in only the narrow sense, only a small proportion of the community was dissatisfied. Stakeholders from surrounding areas of OR and the region consistently asked that sampling be expanded, EPA ignored all of the community input outside the original group of complainants.

Response: The comment is acknowledged.

4. Section 1.0 - When DOE and FAMU did the original sampling, EPA chose not to participate, provide oversight or split samples. Sampling the same locations after the fact is not "oversight." The community presented many comments on the 1999 sampling plan, yet EPA resisted changing the focus of the study from the originally stated purpose of "validating" DOE's samples.

Response: EPA was not provided the DOE/Florida A&M University sampling and analysis plan for review nor was aware of the conduct of the actual sampling event. Therefore, EPA was unable to participate in any field oversight activities.

5. EPA's sampling effort was to determine, data gaps from sampling performed by DOE in May 1998, this is not supported.

Response: The report has been revised to clarify the purpose.

6. EPA should clarify that the data gaps were in the range of contaminants measured, not in the sampling.

Response: The text has been modified. The EPA analyses included substances not reflected in the 1998 DOE report.

7. On Page vi of the Executive Summary, there is indication that somewhat high manganese natural levels in OR may have been due to air borne manganese from the Rockwood mill, while it was in operation.

Response: The comment is acknowledged. The text has been revised to reflect operations other than DOE, although the focus of the EPA study was not other potential sources.

8. Rewrite page vi of the Executive Summary, beginning with the last sentence to avoid misinterpretation by the lay public.

Response: Text has been revised.

9. Page 9 - The TVA Bull Run ash pits indicate the presence of K-40 in the radiological flyovers and presumably some K-40 has been deposited by TVA on the surrounding land contributed to a slightly high background.

Response: The comment is acknowledged. References to other operations have been included in the report, although the focus was not other potential sources.

10. Section 4.0 - The first paragraph is confusing. It identifies six DOE sampling locations, then after stating in Section 2.0 that ten samples were collected, then proceeds to describe ten different sampling locations.

Response: The report has been revised.

11. Page 5, needs to provide a better understanding of the MDC for Strontium. The samples were non-detectable or below the background. The Sr-90 background value is 1 pCi/G, but the value reported in Table 4I for 111 Bennett Lane is 12.9 pCi/gdry.

Response: The MDCs were higher due to the uncertainty of the Sr-90 measured. The results listed have an uncertainty greater than the value measured. Therefore, the value is “less than the detection” or the value reported is not an actual level of contamination.

12. Section 7.0 should reference the relevant table numbers for the analyses they are discussing.

Response: The text has been revised.

13. The data tables also show different units between EPA and DOE samples, with no explanations. Are results listed as pCi/gdry comparable to those in pCi/g?

Response: Yes.

14. Are the EPA and DOE counting times comparable?

Response: Yes.

15. The recommendations are unclear. Does this refer to potential future uncontrolled releases or suspected past releases? If additional outreach is necessary, EPA should be more specific as to what it should be.

Response: Additional outreach for this project is not specifically identified as a recommendation. The recommendations are intended ensure a mechanism exists for DOE to receive, track, investigate and provide feedback regarding the environmental concerns raised by community members.

16. The DOE data is presented in mixed units (unacceptable). EPA/DOE data (shown in Tables 2A-2J in pCi/g) in DOE Scarboro Report, Table 7, page 29 (or any other table). Correct entries for compatibility of EPA data and provide clear references for the DOE data. Also include isotopic specific activities used in the conversion calculations.

Response: EPA can not correct DOE's entry or provide references for their report. DOE chose to use the "ppm" the unit for their report. Although EPA and DOE's data use different uncertainties, they are comparable as they listed in the same units, pCi/g.

17. Page 26 - 33: MDC description in legend is misleading. The KeV values listed are the energies at which these isotopes appear in the most abundance. The numbers may be misinterpreted to represent MDCs.

Response: The legend has been corrected.

18. Explain in lay terms what PRG measures or indicates.

Response: The text has been modified. Please refer to Section 5.0 of the revised report.

19. Reference to Figure 10-1 should be Figure 1. Maps are of no benefit to reader. Maps should be labeled to clearly state locations.

Response: The reference to Figure 10 has been corrected. The map has been modified.

20. Section 10.0 fails to acknowledge that the Y-12 National Security Complex is now a property of the National Nuclear Security Administration, which has a separate chain of command from other DOE programs. EPA should include a recommendation for coordination between NNSA and DOE Environmental Management program.

Response: The text has been modified.

21. EPA could not design and conduct a study to answer all of the many questions and concerns raised by people in the community during public meetings in Feb 1999 and Sept 2001, as well as in comments submitted on the draft sampling plan published in 1999.

Response: The comment is acknowledged.

22. These studies may support future work by the Agency for Toxic Substances and Disease Registry, but have limited relevance to historical dose in and of themselves.

Response: The comment is acknowledged. The EPA study was designed to focus on current exposures in the Scarboro community and not evaluate historic releases.

23. The report should explain that while the current effort reveals current exposure, it also, due to the long retention by clay soils, reveals some information on historic exposures for some of these elements.

Response: The text has been revised.

24. EPA should use the opportunity of this report to make it very clear to the public that their reservations have been removed from the DOE Study. These comments should be in Conclusions and the Executive Summary, as well as use the press to correct this matter.

Response: The document reflects EPA's findings. In addition, the two public availability sessions, press announcements and press briefings also assist in stating EPA's position.

25. The use of the words "residents of sampled properties...are not currently being exposed...at these sample locations" and "this general conclusion ...can not be made concerning all of Scarboro since all areas were not sampled" imputes that EPA's results (and DOE's results, by inference) cannot be generalized to describe the environmental condition of the entire community.

Response: The text of the document has been revised for clarity and to reflect EPA's conclusions.

26. Is there any reason to suspect that airborne releases from Y-12 might have crossed the ridge and contaminated one backyard but not the one next door?

Response: The text of the document has been revised for clarity and to reflect EPA's conclusions.

27. The study leaves doubts that areas within Scarboro may be contaminated, but EPA is not going to do any more testing.

Response: The text of the document has been revised for clarity and to reflect EPA's conclusions. Based on EPA's results, the Scarboro community is safe. Therefore, additional sampling to determine current exposure is not warranted.

28. Many concerns of misinterpreted statements by the *Oak Ridger*. Some of these can be avoided if statements from EPA were concise.

Response: The text of the document has been revised for clarity and to reflect EPA's conclusions.

29. How does Scarboro compare to Oak Ridge in general with uranium concentrations?

Response: The measured value for Uranium+D did not exceed the background range determined for Oak Ridge the United States. Table 11 provides a comparison.

30. In Section 7.1, the results for uranium are given for three isotopes, yet these are not discussed in the obvious context, that of whether or not enriched uranium is present in the Scarboro community. Both DOE and EPA results suffer from the use of an inappropriate analytical technique to determine isotopic composition of uranium at such low concentrations.

Response: Please refer to Section 9.1.6 for discussion on enrichment.

31. In Section 9.0, EPA introduced the concept of "uranium core." An explanation should be provided to state whether this information led to any new conclusions regarding migration of uranium through the soil layer.

Response: The text has been revised to better explain the rationale for collecting the "uranium core" samples.

32. The document does not state how enriched uranium was measured. The explanation should be clearly written in the report.

Response: The document has been modified to provide additional discussion. Please refer to Section 9.1.6.

33. The document does not explain the uncertainties of enriched uranium being high.

Response: The text has been revised for clarity. Please refer to Section 9.1.6 for discussion on enrichment.

34. On Page 13, Section 10.0, the EPA recommendations are weak. DOE should develop a written sampling plan for the community and citizens that live in close proximity to the their facilities that outlines sampling on routine basis. The problem is that it takes too long for DOE to

take action on community concerns. Previous actions were the results of years of complaints from citizens in the community.

Response: The comment will be submitted to DOE and the Tennessee Department of Environment and Health - DOE Oversight Office.

35. Although EPA regards itself as being empowered, it does not regard itself as empowered to clearly state that there is a vanishingly small risk as a result of its studies. EPA can not and does not address the public's concerns, though it stipulates that it will do so. Stop the "practice" of raising the public's hopes of a definitive resolution of its concerns and defer to an agency that can do so.

Response: The comment is acknowledged.

36. EPA commended for clearly stating the results of their findings during the presentations on the level of contaminants in the Scarboro Community and its effect upon the health of the community. EPA's interactions with the community were greatly improved.

Response: The comment is acknowledged.

37. Add brief description of the screening/action process.

Response: The text has been revised to include this process. Please refer to Section 7.0, Analytical Evaluation Methodology.

Written comments received from the following stakeholders:

The Oak Ridge Environmental Justice Committee, Oak Ridge, Tennessee

Ms. Jeanne Bonner, Oak Ridge, Tennessee

The Oak Ridge Reservation Local Oversight Committee, Oak Ridge, Tennessee

The Citizens' Advisory Pane of the Local Oversight Committee, Oak Ridge, Tennessee

Environmental Quality Advisory Board, City of Oak Ridge, Oak Ridge, Tennessee

State of Tennessee, Department of Environment and Conservation, DOE Oversight Division

Appendix A

Web Site Extracts

Preliminary Remediation Goals for Radionuclides

Welcome

Welcome to the EPA's Superfund radionuclide preliminary remediation goal (PRG) download and calculation website. Here you will find risk-based PRGs calculated using default input parameters and the latest toxicity values. In addition, you are able to modify the input parameters to create site-specific PRGs to meet the needs of your site. To ensure proper application of the PRGs, please see further guidance on how to use the PRGs presented on this site located in the "What's New", "FAQ", and "Download Area" links. Below is a general description of PRG use involving radionuclides.

Introduction

The purpose of this database is to provide a PRG calculation tool to assist risk assessors, remedial project managers, and others involved with risk assessment and decision-making at CERCLA sites in developing PRGs. This database is based on Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) (RAGs Part B). RAGs Part B provides guidance on using EPA toxicity values and exposure information to calculate risk-based PRGs. Initially used at the scoping phase of a project using readily available information, risk-based PRGs generally are modified based on site-specific data gathered during the RI/FS study. PRG development and screening should assist staff in streamlining the consideration of remedial alternatives. Chemical-specific PRGs are from two general sources. These are: (1) concentrations based on potential Applicable or Relevant and Appropriate Requirements (ARARs) and (2) concentrations based on risk assessment. ARARs include concentration limits set by other environmental regulations such as Safe Drinking water Act maximum contaminant levels (MCLs). The second source for PRGs, and the focus of this database tool, is risk-based calculations that set concentration limits using carcinogenic toxicity values under specific exposure conditions.

The recommended approach for developing remediation goals is to identify PRGs at scoping, modify them as needed at the end of the RI or during the FS based on site-specific information from the baseline risk assessment, and ultimately select remediation levels in the ROD. In order to set radionuclide-specific PRGs in a site-specific context, however, assessors must answer fundamental questions about the site. Information on the radionuclides that are present onsite, the specific contaminated media, land-use assumptions, and the exposure assumptions behind pathways of individual exposure is necessary in order to develop radionuclide-specific PRGs. This calculation tool provides the ability to modify the standard default PRG exposure parameters to calculate site-specific PRGs.

No consideration is given to ecological effects in the values presented in this database tool. Once this database tool is used to retrieve standard PRGs or calculate site-specific PRGs, it is important to clearly demonstrate the equations and exposure parameters used in the calculations. Discussion of the assumptions that go into the PRGs calculated should be included in the document where the PRGs are presented.

This database tool presents standardized risk-based PRGs and variable risk-based PRG calculation equations for radioactive contaminants. PRGs are presented for residential soil, outdoor worker soil, indoor worker soil, tap water, and fish ingestion. The risk-based PRGs for radionuclides are based on the carcinogenicity of the analytes. Non-carcinogenic effects are not considered for radionuclide analytes, except for uranium for which carcinogenic and non-carcinogenic effects are considered. To determine PRGs for the chemical toxicity of uranium, and for other chemicals, go to the Soil Screening Guidance webpage. The standardized PRGs are based on default exposure parameters and incorporate exposure factors that present RME conditions. This database tool presents PRGs in both activity and mass units. Cancer slope factors used are from HEAST.

This site is maintained and operated through a cooperative agreement between the EPA Office of Superfund and Oak Ridge National Laboratory. For questions or comments please contact Teresa Jones in the Office of Superfund.

Frequently Asked Questions about Radionuclide PRGs

This page presents many questions asked by site users and responses. Please search this page for answers to your questions prior to contacting technical support staff. Researching the questions and answers posted here will greatly reduce the time it takes for you to solve many problems that arise from calculating and using this PRG site.

1. What are PRGs?

PRGs (Preliminary Remediation Goals), presented on this site, are for the Superfund/RCRA programs are risk-based concentrations, derived from standardized equations combining exposure information assumptions with EPA toxicity data. They are considered by the Agency to be protective for humans (including sensitive groups), over a lifetime. However, PRGs are not always applicable to a particular site and do not address non-human health endpoints such as ecological impacts. The PRGs contained in the PRG table are generic; that is, they are calculated without site-specific information. They may be re-calculated using site-specific data.

2. What are PRGs used for?

They are used for site "screening" and as initial cleanup goals if applicable. PRGs are not de facto cleanup standards and should not be applied as such. The PRG's

role in site "screening" is to help identify areas, contaminants, and conditions that do not require further federal attention at a particular site. Generally, at sites where contaminant concentrations fall below PRGs, no further action or study is warranted under the Superfund program, so long as the exposure assumptions at a site match those taken into account by the PRG calculations. Chemical concentrations above the PRG would not automatically designate a site as "dirty" or trigger a response action. However, exceeding a PRG suggests that further evaluation of the potential risks that may be posed by site contaminants is appropriate. PRGs are also useful tools for identifying initial cleanup goals at a site. In this role, PRGs provide long-term targets to use during the analysis of different remedial alternatives. By developing PRGs early in the decision-making process, design staff may be able to streamline the consideration of remedial alternatives.

3. How do PRGs differ from cleanup standards?

PRGs are not de facto cleanup standards, however, they could be used to establish final cleanup levels for a site after a proper evaluation takes place. In the Superfund program, this evaluation is carried out as part of the nine criteria for remedy selection outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Once the nine criteria analysis is completed, the PRG may be retained as is, or modified (based on site-specific information) prior to becoming established as a cleanup standard. This site-specific cleanup level is then documented in the Record of Decision.

4. How often do you update the PRG Table?

The PRG database is updated when new toxicity values are presented by the EPA. This is generally done monthly. However, there may be times when more than one month passes without the release of updated toxicity values. Please take note of the "What's New" page to identify when toxicity values are updated.

5. Can I get a copy of a previous PRG table?

We do not distribute outdated copies of the PRG table. Each new version of the table supersedes all previous versions. If you wish to maintain previous versions of the PRGs for a long-term project, you can download the entire table and save multiple versions with a time-stamp.

6. Where else can I go for toxicity studies (values) not on this site?

Many other web sites host toxicity information, from other countries and other government agencies, similar to this EPA site. The Risk Assessment Information System (RAIS) at http://risk.lsd.ornl.gov/rap_hp.shtml presents toxicity values and

toxicity study information. Web sites of other governmental agencies are also useful. Call the U.S. EPA Superfund Health Risk Technical Support Center at (513) 569-7300 and ask for toxicity values. Call the ATSDR Information Center toll-free at 1-888-422-8737 for toxicity values and profiles.

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